

REMARKS/ARGUMENTS:

Claims 5, 8-10, 23-25, 27-29, 32, and 33 are amended. Support for the amendments to the claims can be found at p. 17, line 22-p. 18, line 1. Claims 5-12 and 23-33 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

The present invention relates to a solar cell element with electrodes coated with solder. The present invention also relates to a solar cell module comprising a plurality of solar cell elements connected to one another by means of connection electrodes. (Applicant's specification, at p. 1, lines 7-12).

INTERVIEW SUMMARY:

On September 10, 2008, Patent Agent Barry Shuman conducted a telephone interview with Examiner Tyler Bennett and the Examiner's Supervisor Alexa Neckel. During the interview the parties discussed the Office Action dated April 30, 2008. Specifically, the difference between Tsuzuki and the present invention was discussed. The Examiner and the Examiner's Supervisor appeared to appreciate the Patent Agent's position that in Tsuzuki there was no step that involved connecting a first inner lead to a second inner lead. However, no definitive agreement was reached during the telephone interview.

Applicant would like to thank Examiner Tyler Bennett and the Examiner's Supervisor Alexa Neckel for the courtesy of granting a telephone interview with Patent Agent Barry Shuman.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103:

Claims 5, 6, 23-25, 32, and 33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki et al. (U.S. Patent No. 6,479,744) in view of Wood

et al. (U.S. Patent No. 6,150,717). Applicant respectfully traverses this rejection as to amended claim 5. Claim 5, as amended, is as follows:

A method for producing a solar cell module comprising:

providing a plurality of solar cell elements each having a front surface electrode formed on a light-receiving surface of a semiconductor substrate thereof, and a back surface electrode formed on a non-light receiving surface of the semiconductor substrate;

connecting a first inner lead to the front surface electrode of one of the solar cell elements, by melting a first solder layer that is disposed therebetween, wherein the first inner lead comprises a metal foil;

connecting a second inner lead to the back surface electrode of another of the solar cell elements, by melting a second solder layer that is disposed therebetween and has a different melting point than the first solder layer, wherein the second inner lead comprises a metal foil; and

connecting the first inner lead to the second inner lead.

Applicant respectfully submits that the cited references cannot render claim 5 obvious, because the cited references fail to teach or suggest "connecting a first inner lead to the front surface electrode of one of the solar cell elements, by melting a first solder layer that is disposed therebetween, wherein the first inner lead comprises a metal foil; connecting a second inner lead to the back surface electrode of another of the solar cell elements, by melting a second solder layer that is disposed therebetween and has a different melting point than the first solder layer, wherein the second inner lead comprises a metal foil; and connecting the first inner lead to the second inner lead."

It is an aspect of the present invention that since the solder on the surface of the connection tab 17 on the light-receiving surface has a higher melting point than the solder on the surface of the connection tab 19 on the non-light receiving surface, the connection tab 17 on the light-receiving surface does not remelt even when heat is applied to attach the connection tab 19 on the non-light receiving surface nor peel off from the bus bar electrode 5 on the light-receiving surface. (Applicant's specification, at p. 24, lines 7-14).

The Office at p. 3, lines 5-19 of the Office Action states,

"Tsuzuki et al. provides a step (col.2; lines: 37-38) for connection tabs/metal member (104) for interconnecting the surface electrode on the light-receiving surface and the back surface electrode on the non-light receiving surface of the solar cell elements as shown in Figures 5A and 5B (col.2; lines: 59-67 & col.3; lines: 1-2). Tsuzuki et al. further disclose the step/process of connecting (col. 7, lines: 1-10) a first connection tabs to the front surface electrode of the one of the solar elements by way of a solder connection and then connecting a second connection tab to the back of the surface electron of another solar cell element by way of soldering (i.e., one layer for each of the two sides of the connection tab) (col. 3; lines: 14-15 & col.16; lines: 30-35) as shown in Figure 5B. Tsuzuki et al. further discloses a step for connecting the first connection tab to the second connection tab as shown in Figure 5B (col.3; lines: 34-37) and utilizes two different material types for electrodes (e.g. lower electrodes (702) are comprised of Al, Ag, Pt, Au, Ni, Ti, etc..) (col.11; lines: 36-39) and upper electrodes (706) are comprised of metal oxides such as SnO<sub>2</sub>, ZnO, etc ... ( col.12; lines: 7-18)."

Applicant respectfully disagrees. Tsuzuki merely teaches a connection by way of solder for connecting one end and another end of a single connection tab 104 to a front surface of one solar cell and to a back surface of another solar cell, respectively (Tsuzuki, column 7, lines 1-11). The Office cites Figure 5B of Tsuzuki for teaching a "second" connection tab/inner lead. However, Applicant respectfully submits that Figure 5B of Tsuzuki only reveals a single metal member (i.e.,

reference numeral 104). In contrast, the present invention requires a first and second connection tab/inner lead. (e.g., reference numerals 17 and 19 in Figure 2C of present application).

Furthermore, Tsuzuki only teaches a connection by way of solder on a back surface of a solar cell (Tsuzuki, column 3, lines 14-15; column 16, lines 30-35); and Tsuzuki fails to teach or suggest a solder connection for use in a connection tab for connecting in the front surface of the solar cell.

The Office at p. 19, lines 4-6 of the Office Action states,

"Tsuzuki et al. discloses two tabs attached to the top and bottom of the cells which is referenced by 103 and 103' as depicted in Figure 5B."

Applicant respectfully disagrees. Tsuzuki teaches that 103 and 103' are insulating members. (Tsuzuki, column 6, lines 26-29). Therefore, since 103 and 103' are insulating, they cannot conduct electricity. Similarly, 103 and 103' cannot be inner leads that comprise a metal foil.

Wood cannot remedy the defect of Tsuzuki and is not relied upon by the Office for such. Instead, the Office cites Wood for disclosing a method for mounting electrical interconnections with solder (i.e., melting the solder) to the electrodes of the semiconductor device; that one of the solder alloys can be a high temperature alloy and the other solder alloy a low temperature alloy and that it aids in the assembly of the semiconductor module; that when an electrode is of a lower melting temperature and the solder is of a higher melt temperature, then the solder can be reflowed to form bonded connections; and the solder temperature is chosen between the melt temperature of the electrode and solder melt temperature to allow for the solder to soften and not enter the liquid phase, such that it will have a structural rigidity.

In light of the foregoing, Applicant respectfully submits that the cited references cannot render claim 5 obvious, because the cited references fail to teach or suggest each and every claim limitation. Claims 6, 23, and 24 depend from claim 5 and cannot be rendered obvious for at least the same reasons as claim 5. Withdrawal of this rejection is thus respectfully requested.

Independent claim 25 and dependent claims 32 and 33 are similarly directed to a method that requires "connecting a first inner lead to the front surface electrode or the back surface electrode of the solar cell element, by melting a first solder layer that is disposed therebetween, wherein the first inner lead comprises a metal foil; and connecting a second inner lead to an electrode of the solar cell element to which the first inner lead is not connected, by melting the second solder layer that is disposed therebetween and has a lower melting point than the first solder layer, after performing the above connecting the first inner lead, wherein the second inner lead comprises a metal foil," and are therefore, patentable over the cited references for reasons discussed above. Withdrawal of this rejection is thus respectfully requested.

Claim 7 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki and Wood as applied to claim 6 above, and in further view of Nakahara et al. (JP 2002/346788). Claim 26 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki and Wood as applied to claim 25 above, and in further view of Nakahara. Applicant respectfully traverses these rejections.

Claims 7 and 26 depend from claims 5 and 25, respectively; and therefore, cannot be rendered obvious over Tsuzuki and Wood for at least the same reasons discussed above. Nakahara cannot remedy the defect of Tsuzuki and Wood and is not relied upon by the Office for such. Instead, the Office cites Nakahara for

teaching a lead-free, Sn-Ag based solder alloy that is an environmentally sound alternative to Pb-based solder while providing high joint dependability.

In light of the foregoing, Applicant respectfully submits that the cited references cannot render claims 7 and 26 obvious, because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 8-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki and Wood as applied to claim 5 above, and in further view of Okada et al. (U.S. Patent No. 6,571,469). Claims 27-29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki and Wood as applied to claim 25 above, and in further view of Okada. Applicant respectfully traverses these rejections.

Claims 8-10 and 27-29 depend from claims 5 and 25, respectively; and therefore, cannot be rendered obvious over Tsuzuki and Wood for at least the same reasons discussed above. Okada cannot remedy the defect of Tsuzuki and Wood and is not relied upon by the Office for such. Instead, the Office cites Okada for teaching a soldering method for the manufacture of a modular board with multiple electrodes.

In light of the foregoing, Applicant respectfully submits that the cited references cannot render claims 8-10 and 27-29 obvious, because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 11-12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki and Wood as applied to claim 5 above, and in further view of Mizukami et al. (U.S. Patent No. 6,369,315) and Okada. Claims 30-31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuzuki and Wood as

applied to claim 25 above, and in further view of Mizukami and Okada. Applicant respectfully traverses these rejections.

Claims 11-12 and 30-31 depend from claims 5 and 25, respectively; and therefore, cannot be rendered obvious over Tsuzuki, Wood, and Okada for at least the same reasons discussed above. Mizukami cannot remedy the defect of Tsuzuki, Wood, and Okada and is not relied upon by the Office for such. Instead, the Office cites Mizukami for teaching a power generation system specifically for use with an array of photovoltaic modules. The Office further cites Mizukami for teaching connecting the photovoltaic array via bus bars and the bus bars contain extensions that are connected directly to "an output fetching line" via a terminal box.

In light of the foregoing, Applicant respectfully submits that the cited references cannot render claims 11-12 and 30-31 obvious, because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of these rejections is thus respectfully requested.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (310) 785-4600 to discuss the steps necessary for placing the application in condition for allowance.

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If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,  
HOGAN & HARTSON L.L.P.

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